

Developing of Biomass Energy May Be a Serious Mistake

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Abstract: Biomass energy development has become a hot field of renewable energy development in recent years. But from ecological viewpoints, biomass plays an important role in ecosystem nutrient recycling. And it has much more eco-values than energy-values. Utilization of large quantity of biomass for energy purpose, will seriously affect the ecosystem nutrient cycling, and endanger the health and sustainable development of ecosystem. Developing biomass energy may be a serious mistake for energy development. On the contrary, solar energy has the potential characteristics of human future major energy, and solar energy development should be the major field for renewable energy development.

Keywords: biomass energy, serious mistake, energy developing

1. INTRODUCTION

Biomass is organic materials from plants or animals (DOE of USA). Biomass energy is the 4th energy and its consumption is only less than coal, petroleum and natural gas. And it's also the first renewable energy and its consumption is more than solar energy, wind energy, geothermal energy, water energy and ocean energy. Biomass resource is abundant and renewable. Also it's regarded as an energy source with zero CO₂ discharging (its absorption of CO₂ in its production is equal to its discharging of CO₂ in burning). So, it is usually regarded as hopeful and ideal energy for the future. As a result, biomass energy development has become a hot field of renewable energy development in recent years.

But from ecological viewpoints, biomass plays an important role in ecosystem nutrient cycling. And it has much more eco-values than energy-values. In terms of its energy scale and its transforming efficiency, biomass energy cannot possibly be an important energy either. Biomass energy development may be a serious mistake. But solar energy has the potential characteristics of human future major energy, and the solar energy development should be the major field for renewable energy development.

2. THE POTENTIALS OF BIOMASS

The biomass resource is abundant on the earth. The biomass energy production of global ecosystem per year is approximately 6–10 times of global total energy consumption in total. According to statistics, global biomass potentials amount to 10 billion tons of dry materials, and the biomass outputs from forests, grassland and farms only amount to 5 billion tons, which is equal to 2 billion tons of standard coal. In China, there is a great variety of biomass that can be

utilized as energy, such as: agricultural wastes (straw, stalk and husk), firewood, forestry junks (leaves and branches), human and domestic animals' excretions etc. The four kinds of biomass (straw and stalk, firewood, excretions and garbage) energy is equal to 308, 130, 77 and 143 million tons of standard coal respectively, and total is 658 million tons^[1].

In terms of quantity, Chinese biomass energy scale is huge. But what kind of role it will play in the country's total energy consumption? With the improving of life quality, the developing of the national economy, and the sharp increasing of China's energy consumption, China's total energy consumption reached 1678 million tons of standard coal in 2003, an increase of 10.1% over 2002.^[2] And it was 1845 millions tons in 2004, an increase of 15% over 2003. According to the estimation and forecast of the National Information Centre (China), China will consume 2160–2320 million tons standard coal in 2010 and 3000 million tons in 2020.

Contrary to the rapid increasing of energy demand, the biomass quantity available for energy use is reducing continuously in China. To maintain the health and sustainable development of agro-ecosystem, larger quantity of biomass has been urged to return into soil and agro-ecosystem by the Agriculture Ministry of China. According to "China Environmental Condition Bulletin 2003", 14.59 million hectares of strew and stalk has been returned into soil directly by machine in 2003, an increase of 179 thousands hectares over 2002. And also there has been 140 million tons of greening stored straw and stalk, 56.5 million tons of ammonia straw and stalk. In ten major provinces, about 9.3 million hectares of strew and stalk has been returned into soil directly by machine, an increase of about 3.24 million hectares over 2002. Strew and stalk comprehensive usage has been up to 48%. Therefore, the latent quantity of biomass available for energy purpose will become less and less.

So, biomass energy is impossible to become an important energy at least in China.

3. BIOMASS HAS MUCH MORE ECO-VALUES THAN ENERGY-VALUES

From ecological viewpoints, biomass plays an important role in ecosystem nutrient cycling and ecosystem balance. And it is a strategic resource to maintain the health and sustainable development of agro-ecosystem. It has much more eco-values than energy-values.

Though long-term evolution, natural ecosystem has formed the complete producer, customer and decomposer structure. It can accomplish the "producing—consuming—decomposing—reproducing" material cycling function by itself.^[2] Their energy and informatics flow unobstructed. Ecosystem goes on efficiently by self-regulating. Biosphere develops healthy and sustainable. In a word, the well-running nutrient cycling is the foundation of ecosystem health and flourishing.

In the self-sufficient and naturally economic society, limited food production went on locally and food consumed locally. Naturally the nutrient returns to soil in forms of straw and stalk, as well as the excretions of domestic animals and human. The nutrient recycling chain of farmland ecosystem was completed. Ecosystem function was steady and it flourished continuously.

However, with the transformation into massive production, marketing economy, cityfying and modern agricultural model, agricultural resource and product flowed in larger scale. The nutrients (in human and domestic animals' excretions, straw and stalk) were impossible to return completely into soil again. The nutrient contact between human living system and agro-ecosystem was interrupted. The nutrient cycling chain and its balance was damaged heavily. As a result, soil organic substance content was reduced, farmland potential production dropped and agro-ecosystem became barren gradually. Farmers had to use large quantity of chemical fertilizer to replenish the loss of soil nutrient in order to maintain the soil productivity, which increased the cost of agro-production. The usage of chemical fertilizer and farm chemicals in large quantity resulted in soil, water and air pollution. And it threatened food, environmental safety and human health. This is only side of the coin. On other hand, cities have to build large-scale contaminant handling facility to handle various contaminants (but most of them are soil nutrients) expensively, which increased cities' financial burden and in the same time resulted in large amount of garbage and environment degradation.

The breaking of nutrient recycling chains, heavily threatened the health of agro-ecosystem and the sustainable development of whole society. And the direct cause of this breaking is that the nutrients in biomass could not be returned into soil. Due to unreasonable production and living model of human beings, most kinds of biomass were turned into wrongly-placed resource. It not only couldn't perform its great role in ecosystem, but also caused serious pollution and ecological degradation.

Obviously, we must recovery the health and sustainable development of agro-ecosystem by reconstructing its nutrient cycling and returning the nutrients into soil completely. So, from ecological viewpoints, the utilization of large quantity of biomass for energy purpose, will deeply affect the ecosystem nutrient cycling chain, and endanger the health and sustainable development of ecosystem. Treating biomass as an energy source is no difference as burning it directly for ecosystem nutrient cycling.

Similarly, from ecological viewpoints, biomass has much more eco-values than energy-values and therefore it should not have been used as energy source. But some by-products, such as firedamp produced in biomass fermentation and could not cause environment degradation, can be used as assisted energy for living. But it is far from being a major energy source for us.

4. SOLAR ENERGY SHOULD BE THE MAJOR ENERGY SOURCE FOR THE FUTURE

The final source of all kinds of energy (including wind energy, water energy, biomass energy, fossil energy etc.) of global ecosystem is the sun. Sun energy is transformed into biomass energy by photosynthesis of green plants.

But the efficiency of transforming solar energy into biomass by green plants is very low. According to the estimation of Shen,^[4] the maximum solar energy transforming efficiency of plant is about 5% in theory. But actual investigated results showed that, the average solar energy transforming efficiency of global plants is 0.13%, crops are 0.4%, rice field is 1.2%~1.5% and high-yield grass is 2.2%~3.0%. In a word, the green plants' solar energy transforming efficiency is fairly low. Therefore we can conclude that the global biomass production is limited and its potentiality also is limited.

In 1954, American Bell laboratory has succeeded to make the first piece of solar energy battery in the world. Its solar energy transforming efficiency is 4%, which is much higher than that of global green plants' in average (0.13%). With the development of technology, solar energy battery's transforming efficiency is improving quickly. Today, the practice-scale solar energy battery's efficiency has been more than 20%. In another word, a piece of solar energy battery can produce 153.85 (20% vs 0.13%) times energy of green plants (in average, in global). In theory, the (in developing) 3rd generation solar energy battery's efficiency could be up to 95%.^[5] It is 737.77 times of green plants and more than 30 times of high-yield grassland in solar energy transforming efficiency.

In terms of energy scale, it is estimated that the amount of solar energy absorption by the Land in China, is equal to about 2400 billion tons standard coal per year. And it is about 3647 times of total biomass energy production.

If we could utilize 1% of land area for solar energy to generate electricity in China, calculated by 20% solar energy transforming efficiency, we could yield energy equivalent to about 4.8 billion tons standard coal. It is 1.6 times of the total energy demands in

2020 in China. But its total biomass energy only can meet about 21.9% of its need. It is not difficult to predict that solar energy will be the first selection as human future major energy, with the gradual exhausting of fossil energy and the developing of solar energy technology and its industry.

The rapid increasing of solar energy industry in recent years verifies this view well. According to the estimation of Strategies Unlimited Company, the sales volume of global solar energy battery has exceeded 990 MW in 2004, an increase of 47% over 2003. And the sales volume of global solar energy battery increased by more than 40% from 2000 to 2004.

Above all, in terms of energy scale and its transforming efficiency, biomass energy could not be the human important future energy. Biomass energy development is a serious mistake for energy development. But solar energy has the potential characteristics of human future major energy, and solar energy development should be the major field for renewable energy development.

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